BENJAMIN G. LAMME

By NORMAN W. STORER, *General Engineer on Railway Development, Westinghouse Electric and Manufacturing Co.*

TO anyone who knows Benjamin G. Lamme, and is in any way acquainted with his work, the news that he has been awarded the Joseph Sullivant Medal by his Alma Mater, the Ohio State University, came not as a surprise, for his friends are becoming accustomed to seeing honors come in Lamme's direction. It was regarded as just that much more evidence that people are really beginning to appreciate the great work he has been doing. This award is particularly welcome, since it gives a measure of the relative value to the world, of engineering achievements and those in other walks of life — a measure which has never before been given by our University. It may be questioned whether this award really affords such a measure, but I submit that with the field wide open, and with the large number of highly successful and eminent graduates of Ohio State University, in literature, art, science and many other professions, who were considered logical candidates for the honor, the award of the Joseph Sullivant Medal to Mr. Lamme for great engineering achievements, is evidence that the profession of engineering is coming into its own. There are other evidences that such is the case, but coming from a great University, it is especially appreciated and is a cause for congratulation to every engineer and still more so to the student of engineering who now has tangible evidence that the engineer has a recognized standing in the community.

BENJAMIN G. LAMME

Who is this man Lamme, and what are these great engineering achievements that won him such signal honor? These are the things I want to tell you about, and, if you will be patient for a few minutes, I shall give you some inside facts about the case.

Yes, of course, Lamme was born on a farm, down near Springfield, Ohio. According to Who's Who, the date of that great event was January 12, 1864. History is silent as to whether he arrived in the midst of an electrical storm, or what there might have been in his prenatal life that produced such a marked effect on his mind and made him develop as he did. But it is certain that he was an unusually thoughtful child, that he had unusually great analytical and mathematical ability. It needed just the atmosphere of the farm to bring these out and develop them. Add to his thoughtful disposition and his analytical and mathematical ability, a high ambition, industry, persistence, forethought, a determination to subordinate everything to the one idea, and with it all a sincere, simple, modest, unassuming and lovable disposition, and you have the hero of this tale.

It is most fortunate that he was born on the farm and went to country schools where one teacher had to teach everything from A,B,C's to algebra. He had to shift for himself very largely and consequently developed his great talent to the utmost. It is practically certain that he never could have developed as he has if he had gone through the regular routine of the present city graded schools, where every child is pushed through the same hole, no matter whether he is round or square, large or small. If Lamme had been brought up in the

city, his time would have been filled with the regular tasks that are laid out for city school children, and with the excitement of city life in general. He would probably have been a brilliant student, but, trained along standard lines, would never have become the Lamme we know. He never would have studied mental arithmetic, never learned the multiplication table up to the 36's or have acquired the numerous short cut methods for calculation for which he is famous. He would probably have had so many mechanical toys that he wouldn't have had time or incentive to dismantle the old clocks and study their mechanism.

In one way the city life might have given him greater opportunities—opportunities for acquiring knowledge and for developing his faculty for character analysis; but if he had acquired knowledge, it might have been at the expense of wisdom. If, in his character analysis, he had studied many people, it might have tended toward superficiality.

When he went to the Ohio State University in 1883, he entered the Freshman class and took up Analytical Geometry without having had Trigonometry. He learned that Trigonometry was an essential to the study of Analytics, so he crammed Trigonometry night and day for four days prior to the opening of classes and in that time learned more about it than most of his classmates knew, so he soon took his place at the head of that class just as he did in practically every class he entered.

Much of his success in college he ascribes to his rigid training in mental arithmetic, his mastery of the multiplication tables in their higher range, and the numerous short cut methods for calculation. His ability in this line was so great that it sometimes got him into trouble with his teachers. An instance of this was when Prof. Robinson once gave him a mass of important tabulated calculation for him to check, as it was necessary to eliminate errors. Prof. Robinson expected it would take him a day or two but to his surprise, Lamme brought the completed job back to him a couple of hours later with errors marked here and there through the whole tabulation. He could not believe that Lamme had checked the calculations throughout, but after going over a part of them himself, finally accepted the rest, but couldn't understand how Lamme had done it.

So it was all through college. Always at the head of the class, he was credited with learning things easily. Lamme claims, however, that it was more due to his early mastery of fundamentals and to his hard work. He maintains that higher mathematics did not "come easy" to him, but was mastered only by the hardest kind of study.

He graduated in Mechanical Engineering in 1888, having been out durnig the year '86-'87 on account of his father's illness and death.

He had had but little opportunity to study electricity as there was no electrical engineering course at that time. He had, however, taken a great interest in the subject and had picked up information whenever possible. It was due to his interest in this subject that he entered the employ of the Westinghouse Co. in 1889, about a year after graduation. He was willing to start in at the munificent salary of $30.00 per month and work all hours of the day and night without additional pay, just to gratify his desire to learn more about electricity.

It was opportune that the late Albert Schmid, then Superintendent of the Company, was looking for some one who could "figure." He soon found that there was a young fellow in the testing room who could "figure," and after Lamme had had all kinds of work loaded on him in the testing department to try him out, he was given a chance to "figure" to his heart's content.

The design of motors and generators in those days was mainly only a matter of cut and try, of experiment, pure and simple. Mr. Schmid thought that electrical phenomena must be subject to natural laws just the same as materials are, so he started Lamme out to discover these laws and devise methods for calculation of machines in accordance with them. His success in that line is the foundation for the success of the Westinghouse Electric & Manufacturing Co., and has influenced and accelerated the development of electrical apparatus the world over. It is attested by more than 150 patents which have been granted to him.

To attempt to follow Lamme's career through his more than 33 years of active engineering work (and he is still as active as ever) would far exceed the scope of this article. I can only touch the high spots.

How quickly he got into action will be seen from the fact that scarcely six months after his coming to the company, he calculated the electrical design of the double reduction gear railway motor which was put on the market early in 1890. This was very similar in design to others that were in use at that time so that it showed little more than an ability to calculate the magnetic circuit and to determine the saturation curve.

In the summer of 1890, however, he began work on the design of a street car motor with but a single gear reduction. This was the forerunner of the celebrated Westinghouse No. 3—a motor that set the type for street car motors that still persists. It was radically different from anything that had appeared previously and its success when put out early in 1891, was instantaneous.

At this same time, he was working on direct current arc machines and alternating current generators, making improvements in the latter which increased their output by 50%. In 1892 he began work on the induction motor and produced the first successful distributed winding motor of this type. In 1892, Mr. Westinghouse took the contract for lighting the World's Fair. Great polyphase generators had to be designed for this purpose and Lamme did it. He also designed the synchronous converter, large induction motor and other machines which were exhibited at the Fair. At this same time, he was designing railway generators whose per-

formance was the boast of the Westinghouse Company.

Then came the Niagara Falls power development, for the electrical apparatus of which Mr. Westinghouse took the contract. The huge umbrella type generators rated at 5000 HP each, were calculated to a nicety by Lamme, and the machines were a great success.

About the year 1895, he conceived the idea that led to the development of the well known Type C induction motor with the "squirrel cage" rotor. People still swear by the Type C motors and also by Lamme's paper on induction motors, which is a recognized classic.

His great work on the synchronous converter, however, he regards as his greatest achievement. For years, he fought the battle for the synchronous converter almost single handed. He won out, as usual, and this is now the accepted machinery for converting alternating into direct current.

Then came his conception of the single phase A. C. railway system. He had long held the belief that the success of heavy electric railroading lay in the use of a high voltage alternating current on a single overhead trolley. He felt that the simplicity and advantage of this system with its simple substations containing nothing but lowering transformers and with no attendants required, were so great that it **must come.** The main difficulty lay in finding suitable ways and means for utilizing the single phase alternating current. After several attempts, Lamme succeeded in designing a series commutator type of motor with suitable characteristics, which he described along with the system of power distribution in his famous paper before the A. I. E. E. in 1902.

The paper created a furore of excitement all over the civilized world and soon every electrical manufacturer was working madly on the problem, and a dozen types of motors were on the market. Lamme has never pinned his faith solely to the commutator type motor, although that is the type that has been most used. He has maintained that one of the great advantages of the system lay in the fact that several different types of equipment could be used, all running under the same trolley. This has been exemplified in the case of one large railroad which uses three phase induction motors. Other equipments using direct current driving motors have been tried. As showing how the system has been accepted, there are a number of influential companies in Europe and some of the largest railroads in this country that have adopted the alternating current system as standard.

It would seem that the actual design work in connection with all the above named types of apparatus and the innumerable other machines with which he has been connected, would have been more than he could handle, but they constituted simply his regular work. He seldom took any of his work home with him, but for 15 years, his chief recreation consisted in working and studying over problems and methods of design, spending from 3 to 5 hours every night on them. It is little wonder, therefore, that he occasionally gets "peeved" when people talk about "how easy things come" to him.

To my mind, Lamme is a most wonderfully happy combination of native ability, high ideals, unswerving purpose, and environment. How absolutely unswerving is his purpose has been illustrated innumerable times. It has come to be a byword that Lamme will never allow himself to be persuaded into doing something that he had not planned for and does not care to do. He will never attend a dinner or banquet of any sort if he can possibly avoid it—and he is wonderfully resourceful—witness the fact that although he is a most loyal Ohio State alumnus, he has never yet attended a meeting of the Pittsburgh alumni.

He is a great reader, having a particular fondness for the wildest, weirdest, most imaginative tales he can find. His collection of such books is one of the best in the country.

He has a great fondness for puzzles and will work for years if necessary to solve one.

In the foregoing, not much has been said of Mr. Lamme's ability to analyze character, and of his interest in young men, but this is one of his strongest characteristics. For years, he has made a study of the young men who come to the Westinghouse from colleges all over the country. His analysis of their ability and characteristics is of the greatest benefit, both to the young men themselves and to the Company. He takes a great interest in the students and devotes a large part of his time to them, in discussing their problems and in giving actual instruction in his design school.

This sketch would not be complete without a few words in regard to his writings. He is not a prolific writer, but when he does write, the engineering world sits up and takes notice. He has the happy faculty of being able to put his thoughts on paper so that anyone with the rudiments of the subject can understand them. One of his greatest assets is his ability to get a physical conception of every problem and he aims to give that in his paper. He never writes mathematical papers, although it is not for lack of the ability—he regards mathematics as his tools that are to be put away when the work is done. Consequently, his papers are in great demand and are very widely read.

Mr. Lamme has received the highest honors from the American Institute of Electrical Engineers, in being elected one of the two members from that body on the Naval Consulting Board during the war and being chairman of the Inventions Committee of that Board. A couple of years go, he was also awarded the Edison Medal by the A. I. E. E. for his engineering achievements. All of these were in consequence of his work and ability as an engineer; he was in competition with engineers only. When the Board of Trustees of Ohio State University awarded him the Joseph Sullivant Medal, it was a recognition of the value of his work to the world. In this recognition of Benjamin G. Lamme, all engineers must rejoice.